

STUDENT ID NO

MULTIMEDIA



UNIVERSITY

--	--	--	--	--	--	--	--	--	--	--	--

# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 3, 2016/2017

**PEM0026 – TRIGONOMETRY AND GEOMETRY**  
(All Sections/Groups)

1 JUNE 2017  
9.00 a.m. – 11.00 a.m.  
(2 Hours)

---

### INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working **MUST** be shown.
4. Only **NON-PROGRAMMABLE** calculator is allowed.

## APPENDIX

TRIGONOMETRY IDENTITIES

$$\sin^2 \theta + \cos^2 \theta = 1 \quad ; \quad \sec^2 \theta = 1 + \tan^2 \theta \quad ; \quad \csc^2 \theta = 1 + \cot^2 \theta$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$$

$$2 \cos A \cos B = \cos(A + B) + \cos(A - B)$$

$$2 \sin A \sin B = \cos(A - B) - \cos(A + B)$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2} \quad ; \quad \sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2} \quad ; \quad \cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin^2 \frac{A}{2} = \frac{1 - \cos A}{2} \quad ; \quad \cos^2 \frac{A}{2} = \frac{1 + \cos A}{2} \quad ; \quad \tan^2 \frac{A}{2} = \frac{1 - \cos A}{1 + \cos A}$$

$$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}} \quad ; \quad \cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}} \quad ; \quad \tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

Continued...

**QUESTION 1 (25 MARKS)**

(a) Given that  $\sin \theta = \frac{a-8}{a}$ ,  $\cos \theta = \frac{12}{a}$  and  $\theta$  lies in the first quadrant. Find the constant  $a$ .

[6 marks]

(b) Given that  $\cos \theta = -\frac{4}{5}$  and  $\tan \theta > 0$ , find the remaining 5 trigonometric functions.

[5 marks]

(c) Given function  $f(x) = 5 \sin(4x - \pi) + 2$ ,

i. find the amplitude, period, and phase shift of the function  $f(x)$ .

[5 marks]

ii. sketch the graph of  $f(x)$  in the interval of  $0 \leq x \leq 2\pi$ .

[5 marks]

(d) If  $\tan \theta = 2$ , show that

$$\frac{2 \sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 5$$

[4 marks]

**Continued...**

**QUESTION 2 (25 MARKS)**

(a) Prove the following identity

$$-4 \sin^3 \theta + 3 \sin \theta = \sin(3\theta)$$

[6 marks]

(b) Write the expression for  $\sin(\sec^{-1} u)$  as an algebraic expression in terms of  $u$ , where  $u > 0$ .

[4 marks]

(c) Solve the following equation on the interval  $0 \leq \theta \leq 2\pi$ .

$$2 \sin^2 \theta - 2 \sin \theta \cos \theta = 1$$

[8 marks]

(d) Given that  $a = \sin \theta$  and  $b = \cos^2(2\theta) + \cos^2 \theta$ .

Express  $b$  in term of  $a$  by eliminating  $\theta$  with the use of trigonometry identities.

[7 marks]

**Continued...**

**QUESTION 3 (25 MARKS)**(a) Given an equation of  $r = 6\sin\theta$ 

i. Transform the equation to rectangular form. Determine whether the equation represents a circle.

[6 marks]

ii. Graph the equation in rectangular grid

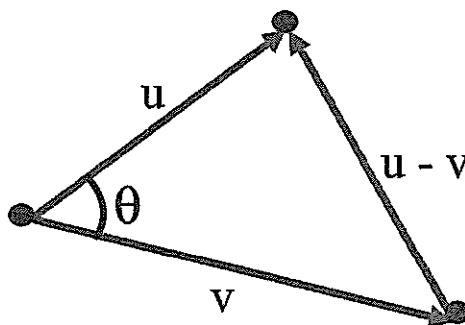
[2 marks]

(b) Find the complex cube roots of  $2 + i$ . Leave your answer in polar form with the argument in degrees ( $0 \leq \theta < 360^\circ$ ).

[4 marks]

(c) Based on the following diagram, show how the law of cosines can be used to find the angle in between the two vectors  $u$  and  $v$ .

[5 marks]

(d) Given two vectors  $a = -2i + 3j + 6k$  and  $b = 5i - 4j + 7k$ . Find their

i. Dot product

[4 marks]

ii. Cross product

[4 marks]

**Continued...**

**QUESTION 4 (25 MARKS)**

(a) Given point  $A (0,2)$ . Find the equation and sketch the graph of a line passing the point  $A$  if

i. the slope  $m = 0$

[2 marks]

ii. the slope  $m = -2$

[2 marks]

(b) Write the equation of the lines that parallel to the graph  $2y - x = 4$  and containing the point  $(-4, 4)$ .

[6 marks]

(c) Find the vertex, the focus , the directrix and the length of the latus rectum of the parabola  $x = -\frac{1}{4}(y + 5)^2 + 3$  .

[12 marks]

(d) Check if the graph  $x^2 + (y - 2)^2 = 4$  is symmetric with respect to

i. x-axis

[1 mark]

ii. y-axis

[1 mark]

iii. the origin

[1 mark]

**End of Paper**